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APR 1 7 2003
PATENT & TRADEMARK OFFICE

Xerox Docket No. D/98643 AF 2600

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

#12
11-14-03

In re the Application of

Zhigang FAN et al.

Application No.: 09/447,554

Filed: November 23, 1999

For: MAXIMUM LIKELIHOOD ESTIMATION OF JPEG QUANTIZATION VALUES

On Appeal from Group: 2623

Examiner: J. Wu

Docket No.: 104184

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APPEAL BRIEF TRANSMITTAL

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

Attached hereto are three (3) copies of our Brief on Appeal in the above-identified application.

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BRIEF ON APPEAL

Appeal from Group 2623

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APPENDIX A-1

I. INTRODUCTION

This is an Appeal from an Office Action mailed November 18, 2002, finally rejecting claims 1-22 of the above-identified patent application.

A. Real Party in Interest

The real party in interest in this Appeal in the present application is XEROX CORPORATION, by way of an Assignment filed November 23, 1999, and recorded at Reel 010412/Frame 0522.

B. Statement of Related Appeals and Interferences

There are presently no appeals or interferences, known to Appellants, Appellants' representative or the Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

C. Status of Claims

Claims 1-22 are pending. Claims 1-22 are on appeal. Claims 1-22 are set forth in the attached Appendix. Claims 1 and 11 are independent claims. Claims 2 and 3 depend directly from claim 1. Claims 6, 7, and 22 depend indirectly from claim 1. Claims 4, 5 and 8-10 depend indirectly from claim 1. Claims 12, 13, 16, 17 and 22 depend directly from claim 11. Claims 14, 15 and 18-20 depend indirectly from claim 11.

D. Status of Amendments

The Amendment filed on September 25, 2002 is the only Amendment filed, and the Amendment has been entered. Claims 1-3, 6-13 and 19, as amended, and new claims 21 and 22, are found in the April 10, 2002 Amendment. Claims 4,5, 14-18 and 20 are originally filed claims, which have not been amended.

II. SUMMARY OF THE INVENTION AND APPLIED REFERENCES

A. Related Art Problems Overcome by the Invention

In processing decompressed images, such as decompressed JPEG-compressed images, for example, a quantization table is often required. However, the quantization information is often not available to the image processing system, especially when the image is decompressed remotely. In particular, if the image was decompressed apart from the image processing, the image processing system might not have available information indicating that the image has been JPEG compressed, for example, or information identifying or defining the quantization table(s) used to compress the image.

B. Objects of the Invention

One object of this invention is to provide systems and methods that process images without requiring information on whether the image was previously compressed or how the image was compressed.

Another object of this invention is to provide systems and methods that determine quantization values of one or more image blocks of a decompressed image.

Another object of this invention is to separately provide systems and methods that are able to identify a compression method used to compress a decompressed image to be processed.

Another object of this invention is to provide systems and methods to determine if a decompressed image was previously compressed at least in part using a JPEG compression technique.

Another object of this invention is to provide systems and methods useable to process a JPEG compressed digital image.

C. Description of the Invention

Fig. 1 shows a generalized functional block diagram of a system 100 that includes an image processing system 200 according to this invention. The system 100 can include an image source 110 that may be any one of a number of different sources, such as a scanner, a digital copier or a facsimile device suitable for generating electronic image data, or a device suitable for storing and/or transmitting the electronic image data, such as a client or a server of a network. The electronic image data from the image source 110 is provided to a compressor 400 of the system 100.

In particular, in various exemplary embodiments, the compressor 400 compresses the image using various compression operations associated with the JPEG compression standard to compress the image data within a block. However, it should be appreciated any known or later developed compression technique that compresses and quantifies the image data on a block-by-block basis is equally relevant to the image processing systems and methods of this invention. In the compressor 400, the data may be operated on in any of a number of well-known bit- or byte-wise operations to accomplish the compression of the image data, wherein additional information is used and/or generated (such as a dynamically adjusted quantization table) as the image is compressed.

Once compressed, the compressed image data then is transferred to the channel or storage device 300. The compressed image data is then processed by the decompressor 500. The decompressor 500 receives the compressed image data from the channel or storage device 300 and recombines the blocks of decompressed image data in their corresponding position. The decompressor 500 sends the reconstructed image to the image processing system 200.

Fig. 2 shows a generalized functional block diagram of one exemplary embodiment of the image processing system 200 according to this invention. The following description of

the image processing system 200 assumes the image to be processed was compressed using a JPEG compression technique.

The image processing system 200 includes an image blocking portion 220, a quantization table estimator 240 and an image processor 260. The image blocking portion 220 divides the decompressed image data into a plurality of MxM blocks or segments. The quantization table estimator 240 inputs the MxM blocks of image data and outputs one or more estimated quantization tables for the blocks to the image processor 260. The image processor processes the decompressed image data based on the one or more estimated quantization tables.

Fig. 3 shows a generalized functional block diagram of one exemplary embodiment of the quantization table estimator 240. In the quantization table estimator 240, a Discrete Cosine Transform is performed on the MxM blocks of image data in a DCT transformer 242. A data buffer 244 inputs and stores the transformed data. A histogram generator 246 inputs the transformed image data from the data buffer 244 and generates a histogram on the image data. An estimated quantization table generator 248 inputs the image data from the histogram generator 246 and generates one or more estimated quantization tables for the MxM blocks of image data.

In operation, the data buffer 244 stores the minimum and maximum values of the compressed image blocks. The histogram generator 246 generates a histogram entry in a histogram for the block for each rounded block value. The quantization table generator 248 generates the quantization table by obtaining the maximum likelihood estimation of the quantization table.

Fig. 4 is a flowchart outlining one embodiment of an image processing method in accordance with this invention. Beginning in step S1000, control continues to step S1100, where the decompressed image data is input. Next, in step S1200, one or more estimated

quantization tables are determined from the decompressed image data. Then, in step S1400, the decompressed image is processed based, at least in part, on the one or more estimated quantization tables. In step S1500, the image is further processed. This further processing generally will not use the estimated quantization table(s).

D. The Claimed Invention

Independent claim 1 recites a method for processing decompressed image data, comprising: receiving decompressed image data; creating an estimated quantization table from the received decompressed image data; processing the decompressed image data based on the created estimated quantization table to form processed electronic image data.

Independent claim 11 recites a system for processing decompressed image data, comprising: a receiver that receives decompressed image data; a quantization table estimator that creates an estimated quantization table from the received decompressed image data; and a processor that processes the decompressed image data based on the created estimated quantization table to form processed electronic image data.

E. The Applied References

1. U.S. Patent 6,011,868 to van den Branden et al.

By way of background, van den Branden et al. discloses that a conventional video decoder dequantizes the quantized DCT coefficients (termed Inverse Quantization of DCT coefficients (IQDCT)) based on the appropriate quantization tables (matrices) and the quantization scale to reconstruct (as near as possible) DCT coefficients. Next, the video decoder performs Inverse DCT (IDCT) calculations and motion compensation to reconstruct pixel data, which is provided as output video data at the appropriate time - see col. 2, lines 23-31.

Van den Branden et al. discloses that there is a need to provide information and quality analysis to those parameters over which designers of MPEG video encoders have

some choice and to monitor and assess the quality of resulting video output data as it is seen after it has been received and by an MPEG video decoder. To these ends, Brandon discloses a bitstream quality analysis system including (1) a demultiplexer, (2) a bitstream quality analyzer, and (3) a graphical user interface.

Van den Branden et al. bitstream quality analyzer includes an MPEG video decoder that receives the elementary bitstream and selectively decodes the video elementary bitstream according to the level of monitoring and quality analysis selected by the user via the graphical user interface. Because the user selectively decodes the video elementary bitstream to the level required by the user, considerable time and computational resources are saved - see col. 3, lines 50-59..

Van den Branden et al.'s bitstream analyzer calculates various metrics allowing the user to determine the quality of the encoding process including, metrics pertaining to the <u>amount of compressed data in the video decoder</u>, how well the encoder estimated the size of the decoder buffer, how well the encoder estimated the bit rate, and whether coded bits are being used efficiently.

Van den Branden et al.'s bitstream analyzer also includes a compressed domain quality meter that (1) predicts the quality of the fully decoded video sequence contained within the video elementary bitstream and (2) predicts amount of spatial distortion in the fully decoded video sequence due to quantization of the DCT coefficients - see col. 4, lines 1-31.

Van den Branden et al. monitors and analyzes a video bitstream. Levels of monitoring and analysis include monitoring the various characteristics and attributes of an MPEG video bitstream, testing for MPEG compliance and real-time decodability, and predicting the visual quality of decompressed video sequences contained in the MPEG video bitstream.

Fig. 8, which is relied upon in the final rejection, is a functional block diagram of a compressed domain quality meter 220 that implements all of the conventional features of a

conventional video recorder - see col. 6, lines 50+. Within the bitstream quality analyzer 190, the compressed domain quality meter (CDQM) estimates various measures of distortion of the resulting video output, as pixel quality, using only the compressed video bitstream (col. 6, lines 59-62).

In col. 12, van den Branden et al. disclose methods of estimating the amount of spatial distortion of a video output stream due to quantization error, including estimating MPEG DCT coefficient distribution based on a statistical modeling of the DCT distribution and the distribution of the quantization error.

2. U.S. Patent 6,064,324 to Shimizu et al.

Shimizu et al. concerns both digital encoding and digital decoding. Shimizu et al provides both (1) a signal encoding apparatus for improving coding efficiency by reducing the amount of codes for communicating the quantization width to the utmost, and (2) a decoding method and apparatus for performing decoding operations corresponding to the encoding operations performed by the aforementioned encoding method and apparatus.

Shimizu et al. explains that in a conventional encoding apparatus, quantization width information is added to the encoded signal using adding section 570 - see col. 4, lines 13-19. However, in Shimizu, information relating to the quantization width is not included in the encoded data - see col. 4, lines 58-60.

In col. 6, lines 56-66, Shimizu discloses that any control method of quantization may be used unless the method at the encoding side differs from the method at the decoding side. In other words, Shimizu is limited to encoding and decoding schemes in which the method of quantization has to be the same on both the encoding and decoding sides.

3. U.S. Patent 5,434,623 to Coleman et al.

Coleman et al. discloses a technique for real time image data compression and encoding using combined luminance/chrominance coding. Coleman et al. allots more storage

space or signal bandwidth to the signal component of greater complexity. The component with the greater information content is allowed more bits in the compression process, requiring an appropriate organization of the data format, and the calculation of a "joint" quantizing factor to be used equally on, or with a fixed relationship between, the signal components - see col. 1, lines 5-10 and col. 4, lines 58-68. Coleman does not discuss decoding the encoded digital video signals.

4. Yovanof et al., "Statistical Analysis of the DCT Coefficients and their Quantization Error" (1996)

Yovanof present a statistical analysis of all data components in a DCT based lossy compression scheme. The data components are the DCT coefficients, their differences, the quantization error, and the reconstruction error. The analysis of the blockwise difference demonstrated the advantages of encoding differences of low-frequency coefficients. The analysis also verified that the high-frequency coefficients are much more skewed than LaPlacian distributed data. Models of the quantization error and the reconstruction error can be used, according to the article, in the design of DCT-based lossy-plus-residual systems. See the conclusion on page 603.

III. THE ISSUES ON APPEAL

1. Are claims 1-5, 7, 8, 10-15, 17, 18 and 20-22 properly rejected under 35 USC §103(a) as unpatentable over U.S. Patent 6,011,868 to van den Branden et al. (referred to in the final Office Action as "Christian et al., which is the first name of van den Branden) in view of either U.S. Patent 6,0564,324 to Shimizu et al. or U.S. Patent 5,434,623 to Coleman et al.?

2. Are claims 9 and 19 properly rejected under 35 USC §103(a) as unpatentable over U.S. Patent 6,011,868 to van den Branden et al. (referred to in the final Office Action as "Christian et al., which is the first name of van den Branden) in view of either U.S. Patent

6,0564,324 to Shimizu et al. or U.S. Patent 5,434,623 to Coleman et al. and further in view of Yovanof et al.?

3. Are claims 6 and 16 properly rejected under 35 USC §103(a) as unpatentable over U.S. Patent 6,011,868 to van den Branden et al. (referred to in the final Office Action as "Christian et al., which is the first name of van den Branden) in view of either U.S. Patent 6,0564,324 to Shimizu et al. or U.S. Patent 5,434,623 to Coleman et al. and further in view of U.S. patent 5,150,433 to Daly?

IV. GROUPING THE CLAIMS ON APPEAL

Five distinct groups of claims, which are separately patentable, exist in the application and, upon issuance of a patent, will be entitled to a separate presumption of validity under 35 USC §282. For convenience of handling of this Appeal, the claims are grouped as follows:

Group I: Claims 1 and 11.

Group II: Claims 2, 12, 21 and 22.

Group III: Claims 3-5 and 13-15.

Group IV: Claims 6-8 and 16-18.

Group V: Claims 9, 10, 19 and 20.

The claims of Group I, i.e., claims 1 and 11, stand or fall together, and are separately patentable from claims 2-10 and 12-20. The claims of Group II, i.e., claims 2, 12, 21 and 22, stand or fall together and are separately patentable from claims 1, 3-11 and 13-20. The claims of Group III, i.e., claims 3-5 and 13-15, stand or fall together and are separately patentable from claims 1, 2, 6-12 and 16-20. The claims of Group IV, i.e., claims 6-8 and 16-18, stand or fall together and are separately patentable from claims 1-5. 9-15, 19 and 20. The claims of Group V, i.e., claims 9, 10, 19 and 20, stand or fall together and are separately patentable from claims 1-8 and 11-18.

Claims 1 and 11 relate to a method of and/or a system for processing decompressed image data involving determining an estimated quantization table from received decompressed data. Claims 2, 12, 21 and 22 further process the image without using the determined quantization table. Claims 3-5 and 13-15 relate to determining the estimated quantization table based on at least one maximum likelihood estimate. Claims 6-8 and 16-18 relate to determining the estimated quantization table in a two step process involving truncated image data values or uniform image data values. Claims 9, 10, 19 and 20 relates to determining the quantization table by identifying a main lobe of a histogram and two adjacent levels.

V. LAW

A. 35 USC §103(a) (Obviousness)

In rejecting claims under 35 USC 103, it is incumbent on the examiner to establish a factual basis to support the legal conclusion of obviousness. See, In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the Examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one of ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal Inc. v. F-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir. 1988), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the Examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note, In re

Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). The mere fact that the prior art may be modified in the manner suggested by the examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992). To establish prima facie obviousness of a claimed invention, all the claim limitations must be suggested or taught by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1970). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). It is well settled that a rejection based on 35 USC 103 must rest on a factual basis, which the Patent and Trademark Office has the initial duty of supplying. In re GPAC, Inc., 57 F.3d 1573, 1582, 35 USPQ2d 1116, 1123 (Fed. Cir. 1995). A showing of a suggestion, teaching, or motivation to combine the prior art references is an "essential evidentiary component of an obviousness holding." C.R. Bard, Inc. v. M3 Sys. Inc., 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232(Fed. Cir. 1998). This evidence may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved. See Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996). However, the suggestion more often comes from the teachings of the pertinent references. See In re Rouffet, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459(Fed. Cir. 1998). This showing must be clear and particular, and broad conclusory statements about the teaching of multiple references, standing alone, are not "evidence." See In re Dembiczak, 175 F.3d 994 at 1000, 50 USPQ2d 1614 at 1617. However, the suggestion to combine need not be express and "may come from the prior art, as filtered through the knowledge of one skilled in the art." Motorola, Inc. v. Interdigital Tech. Corp., 121 F.3d 1461, 1472, 43 USPQ2d 1481, 1489(Fed. Cir. 1997).

It is impermissible for an Examiner to engage in hindsight reconstruction of the claimed invention using appellant's structure as a template and selecting elements from references to fill the page. The references themselves must provide some teaching whereby the appellant's combination would have been obvious. In re Gorman, 911 F.2d 982, 986, 18 USPQ2d 1885, 1888 (Fed. Cir, 1991). That is, something in the prior art as a whole must suggest the desirability, and thus obviousness, of making the combination. See, In re Beattie, 974 F.2d 1309, 1312, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992); Lindemann Machinenfabrik GMBH v. American Hoist and Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984).

VI. ARGUMENT

A. Group I, Claims 1 and 11

Claims 1 and 11 are not obvious over van den Branden et al. (hereinafter, "Branden")in view of either Shimizu et al (hereinafter, "Shimizu")or Coleman et al. (hereinafter, "Coleman". The final Office Action, dated November 18, 2002, asserts that Branden discloses "receiving decompressed image data (Fig. 8). " Applicants respectfully disagree. Fig. 8 discloses the details of Branden's decoder 210 and Compressed Domain Quality Meter (CDQM) 220. Brandon expressly discloses that CDOM 220 "estimates various measures of distortion of the resulting video output (i.e., as pixel output) using only the compressed video bitstream (emphasis added)."

Thus, we see that Fig. 8 receives and acts upon the "compressed video bitstream" and is not used for "receiving decompressed image data."

Accordingly, the fundamental assumption of the final rejection that Branden is receiving uncompressed data is incorrect.

The Office Action continues by alleging that "creating an estimated quantization table from the received decompressed image data" is disclosed by Branden from col. 12, line 36

through col. 13, line 42, alleging that modifying a quantization table to a new one can be viewed as creating a Q table.

Applicants respectfully disagree with these allegations.

Brandon explicitly discloses that the CDQM 220, which is disclosed in col. 6, lines 59-62 as using <u>only the compressed</u> video bitstream, provides three different estimations predicting the amount of distortion in the resulting video output bitstream due to the encoding process - see col. 9, lines 64-66. The <u>first estimate</u> predicts the amount of spatial distortion of the resulting video output stream due to quantization error - see the paragraph bridging cols. 9 and 10 - and is based on a mean square error (MSE) analysis. Brandon computes the MSE once for each of the quantization matrices (tables) - see col. 10, lines 40-45. The <u>second estimate</u> of the predicted amount of distortion of the resulting video output bitstream is based on the refines MSE estimate - see col. 11, lines 19-21. This second estimate is calculated by the CDQM 220 - see col. 11, lines 56-60. As noted above, CDQM 220 uses <u>only the compressed</u> video bitstream. The <u>third estimate</u> of the predicted amount of distortion of the resulting video output bitstream is also based on the MSE estimate - see col. 11, lines 63-65. Other ways to estimate the amount of spatial distortion of the resulting video output stream due to quantization error are disclosed from col. 12, line 36 to col. 13, line 33.

None of the aforementioned estimates is disclosed as creating estimated quantization tables (matrices) from any image data, let alone from decompressed image data.

The next recited feature of claims 1 and 11 concerns processing the decompressed image data based on the created estimated quantization table to form processed electronic image data.

This feature is not disclosed by Branden. Because Branden does not create an estimated quantization table, Branden cannot use a non-existent table to process image data. Moreover, Brandon's DCQM 220 only works with compressed image data, Branden does not

process decompressed image data, as recited. Furthermore, Branden is merely concerned with predicting the quality of the fully decoded video sequence - see the last line of the Abstract - not using the predictions to further process image data, let alone decompressed image data.

The Office Action also alleges that the only feature of the claimed invention missing from Branden is "creating a quantization table without transmitting the quantization table used in the compression process." The Office Action mentions that this feature is "well known in the art." However, the Office Action fails to meets its evidentiary burden of showing this allegedly well known feature. See, in this regard, In re Lee, 277 F.3d 1338, 1343, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002), which clearly states that a factual inquiry whether to modify a reference must be based on objective evidence of record, not merely conclusionary statements of the Examiner.

Moreover, the only claims which recite "further processing of the decompressed image data without using the created quantization table" are claims 2 and 12.

Also, the final rejection mis-states what is claimed in this regard. Claim 2, for example, recites "further processing of the decompressed image data without using the created quantization table", which says nothing about "without transmitting the quantization table used in the compression process."

Yet, based on this mis-statement, the final rejection proceeds to cite and apply two different references, Shimizu and Coleman, alternatively.

Shimizu discloses a digital signal ending and decoding scheme which reduces the amount of codes which communicate (including encoding) the quantization width and perform decoding operations corresponding to the encoding operations. The system appears to be limited to using the same method of quantization at the encoding and decoding sides - see col. 6, lines 56-67.

Coleman is applied for allegedly disclosing "a decoding method and apparatus [that] create a[n] quantization factor without transmitting information on quantization factor (col. 12, lines 10-15)."

In actuality, Coleman is directed solely to a method and apparatus for image data compression and encoding (not decoding, as alleged in the final rejection). Coleman combines the encoding of both the luminance component and chrominance component signal data such that the component with the greater information content is allowed more bits in the compression process. This involves an appropriate organization of the data format and the calculation of a "joint" quantizing factor to be used equally on, or with a fixed relationship between, signal components.

The Office Action concludes that it would be obvious to include the schemes of Shimizu or Coleman in the method of Branden to "improve the compression speed, quality, and the efficiency of the method (Shimizu, col. 1, lines 50-67, Coleman, col. 4, lines 18-67)."

This "motivation" reason is not clear and particular. Rather, it is a broad conclusory statement about the teaching of multiple references, standing alone, and is not "evidence." See Dembiczak, cited above. This rationale does not show that combination of these two references is desirable, which is required to serve as proper motivation to combine these two references in a rejection under 35 USC §103(a).

Moreover, this rationale puts the cart before the horse, i.e., uses as a base reference, a system that analyzes video signal bitstreams regardless of the nature of the bitstream quantization, and then requires one of ordinary skill in the art to include specific types of video signal quantization encoding as part of a reference combination including an analyzer that does not require or need any specific type of quantization.

Applicants respectfully submit that one of ordinary skill in the art is satisfied with, and would have no incentive to combine Branden's analyzer with, a specific type of encoder, when Branden's system is not designed to be used with a specific type of encoder.

Applicants respectfully submit that the motivation to combine Branden and Shimizu or Coleman is improperly based on hindsight using Applicant's invention as a blueprint for combining the references.

Moreover, even if these references were combined, in the alternative, with Branden, the resulting reference combination would not render the claimed invention obvious because neither Shimizu nor Coleman provides the claimed features which are not disclosed by Branden.

Furthermore, the Office Action never provides any details of how Shimizu or Coleman is to be combined with Branden. That is left to pure speculation, and speculation cannot properly serve as the basis for a rejection under 35 USC §103, In re Steele, 305 F.2d 859, 862, 134 USPQ 292, 295 (CCPA 1962), In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970), and Ex parte Lemoine, 46 USPQ2d 1420 at 1430 (Bd. Pat. App. & Int. 1994).

Accordingly, the Office Action has not made out a prima facie case of obviousness of the invention recited in claims 1, 7, 8, 11, 17 and 18, and those claims are patentable over Branden taken in view of either Shimizu or Coleman.

B. Group II, Claims 2, 12, 21 and 22

All of the arguments presented above with regard to the rejection of claims 1 and 11, are incorporated herein. Claims 2 and 12 depend from claims 1 and 11, respectively, and recite further processing the decompressed image without using the created quantization table.

As pointed out above, the Branden Shimizu and the Brandon Coleman reference combinations are improper and do not disclose the features of claims 1 and 11. For at least this reason, claims 2 and 12 are not rendered obvious by this reference combination. Also, none of the applied references disclose the unique feature of processing a decompressed image based on both with and without an estimated quantization table.

Accordingly, claims 2 and 12 are patentable over Branden taken in view of either Shimizu or Coleman.

C. Group III, Claims 3-5 and 13-15

All of the arguments presented above with regard to the rejection of claims 1 and 11, are incorporated herein because the subject matter of claims 1 and 11 are recited in claims 3-5 and 13-15. Claims 3-5 and 13-15 recite that the estimated quantization table comprises creating the estimated quantization table based on at least one likelihood estimation. This distinct feature is not disclosed or suggested by any of the applied references. Branden, from col. 12, line 36 to col. 13, line 42, i.e., the portion of Brandon relied on as the basis of the rejection of claims 3 and 13, only discusses methods of estimating spatial distortion of a video output stream, which are not disclosed as creating an estimated quantization table, as recited.

Accordingly, claims 3-5 and 13-15 are patentable over Branden taken in view of either Shimizu or Coleman.

D. Group IV, Claims 6-8 and 16-18

Claims 6 and 16 stand rejected under 35 USC §103(a) over Branden in view of Shimizu or Branden in view of Coleman, as applied in the rejection of claims 1 and 11, and further in view of Daly.

All of the arguments presented above with regard to the rejection of claims 1 and 11, are incorporated herein because the subject matter of claims 1 and 11 are recited in claims 6

and 16. Claims 6 and 16 recite that the decompressed data comprises blocks, determining for each block, if that block has at least one of truncated image data values or uniform image data values, and excluding any block that has at least one of truncated image data values or uniform image data values.

Daly discloses an edge detection mechanism for image signal data compression for transmission over a bandwidth-limited communication channel to identify the presence of a high contrast edge between relatively uniform areas within a block of transform signals and quantize the block transform coefficients that bypasses an adaptive quantization process - see the paragraph bridging cols. 1 and 2.

The Office Action states that it would be obvious to include the scheme of Daly in the method of Branden "to improve the quality of the images (Daly, col. 1, lines 14-16)."

This "motivation" reason is not clear and particular. Rather, it is a broad conclusory statement about the teaching of multiple references, standing alone, and is not "evidence." See Dembiczak, cited above. This rationale does not show that combination of these two references is desirable, which is required to serve as proper motivation to combine these two references in a rejection under 35 USC §103(a).

Moreover, this rationale puts the cart before the horse, i.e., uses as a base reference, a system that analyzes video signal bitstreams regardless of the nature of the bitstream quantization, and then requires one of ordinary skill in the art to include specific types of video signal quantization encoding as part of a reference combination including an analyzer that does not require or need any specific type of quantization. Furthermore, Branden only discloses an analyzer of image quality, not a device to improve the quality of the images.

Applicants respectfully submit that one of ordinary skill in the art is satisfied with Branden's analyzer and would have no incentive to combine it with a specific type of

compression scheme. Branden's system is not designed to be used with a specific type of encoder.

Applicants respectfully submit that the motivation to combine Branden-Shimizu or Brandon-Coleman with Daly is improperly based on hindsight using Applicant's invention as a blueprint for combining the references.

Accordingly, claims 6 and 16 are patentable over Branden, Shimizu, Coleman and Daly.

E. Group V, Claims 9, 10, 19 and 20

Claims 9 and 19 stand rejected under 35 USC §103(a) over Branden in view of Shimizu or Branden in view of Coleman, as applied in the rejection of claims 1 and 11, and further in view of Yovanof et al. (hereinafter, "Yovanof") .

All of the arguments presented above with regard to the rejection of claims 1 and 11, are incorporated herein because the subject matter of claims 1 and 11 are recited in claims 9, 10, 19 and 20. Claims 9 and 19 recite that creating the estimated quantization table comprises identifying a main lobe of the histogram (generated in claim 8) having a highest peak and two adjacent levels of the histogram and creating the quantization table based only on the identified and adjacent levels of the histogram.

The Office Action indicates that Yovanof determines a quantization table based only on the identified and adjacent levels of the histogram shown in Fig. 4. Applicants respectfully disagreed with this indication.

In actuality, Yovanof merely determines the quantization error in a DCT based lossy compression scheme, and does not create an estimated quantization table based on the histograms shown in Figs. 3 and 4, as alleged.

This is a reference which is cited in Branden and, as pointed out above, Brandon does

not disclose the features recited in claims 1 and 11. It is cited in Brandon only to estimate spatial distortion. If one of ordinary skill in the art were to combine it with Brandon, it would be to estimate spatial distortion, as it was incorporated in Branden and, as such, the reference combination does not address the features recited in claims 1 and 11, let alone in claims 9, 10, 19 and 20.

Accordingly, the subject matter of claims 9, 10, 19 and 20 is patentable over the applied references.

VII. CONCLUSION

Claims 1-22, which relate to five separate and distinct inventions for reasons stated above, are not obvious under 35 USC §103(a), and thus are patentable, over the applied references.

The Honorable Board is requested to reverse the rejections set forth in the Final Rejection and return the application to the Examiner to pass this case to issue.

Respectfully submitted,

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JAO:RJW/sxb

Enclosure:
Appendix

Date: April 17, 2003

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APPENDIX OF CLAIMS

1. (Amended) A method for processing decompressed image data, comprising:

receiving decompressed image data;

creating an estimated quantization table from the received decompressed image data; and

processing the decompressed image data based on the created estimated quantization table to form processed electronic image data.

2. (Amended) The method of claim 1, further comprising further processing of the decompressed image data without using the created quantization table.

3. (Amended) The method of claim 1, wherein creating the estimated quantization table comprises creating the estimated quantization table based on at least one maximum likelihood estimation.

4. The method of claim 3, further comprising generating the at least one maximum likelihood estimation based on a probability function.

5. The method of claim 3, further comprising generating the at least one maximum likelihood estimation based on a Gaussian distribution.

6. (Amended) The method of claim 1, wherein the decompressed data comprises image data blocks, and creating the estimated quantization table comprises:

determining, for each block, if that block has at least one of truncated image data values or uniform image data values; and

excluding any block having at least one of truncated image data values or uniform image data values.

7. (Amended) The method of claim 1, wherein creating the estimated quantization table further comprises generating transformed image data from the decompressed image data using a discrete cosine transform.

8. (Amended) The method of claim 7, wherein creating the estimated quantization table further comprises generating a histogram from the transformed image data.

9. (Amended) The method of claim 8, wherein creating the quantization table comprises:

identifying a level of a main lobe of the histogram having a highest peak and two adjacent levels of the histogram adjacent to the identified level; and

creating the quantization table based only on the identified and adjacent levels of the histogram.

10. (Amended) The method of claim 8, wherein creating the estimated quantization table further comprises rounding each DCT coefficient of the transformed image data.

11. (Amended) A system for processing decompressed image data, comprising:

a receiver that receives decompressed image data;

a quantization table estimator that creates an estimated quantization table from the received decompressed image data; and

a processor that processes the decompressed image data based on the created estimated quantization table to form processed electronic image data.

12. (Amended) The system of claim 11, wherein the processor further processes the decompressed image data without using the created quantization table.

13. (Amended) The system of claim 11, wherein the quantization table estimator creates the estimated quantization table based on at least one maximum likelihood estimation.

14. The system of claim 13, further comprising a maximum likelihood estimator that generates the at least one maximum likelihood estimation based on a probability function.

15. The system of claim 13, further comprising a maximum likelihood estimator that generates the at least one maximum likelihood estimation based on a Gaussian distribution.

16. The system of claim 11, wherein:

the decompressed data comprises image data blocks: and

the quantization table estimator comprises a block analyzer that determines, for each block, if that block has one of truncated image data values or uniform image data values, wherein the quantization table estimator excludes any block having at least one of truncated image data values or uniform image data values.

17. The system of claim 11, wherein the quantization table estimator further comprises a DCT transformer that generates transformed image data from the decompressed image data using a discrete cosine transform.

18. The system of claim 17, wherein the quantization table estimator further comprises a histogram generator that generates a histogram from the transformed image data.

19. (Amended) The system of claim 18, wherein:

the quantization table estimator further comprises a peak identifier that identifies a level of a main lobe of the histogram having a highest peak and two adjacent levels of the histogram adjacent to the identified level; and

the quantization table estimator creates the quantization table based only on the identified and adjacent levels of the histogram.

20. The system of claim 18, wherein the quantization table estimator further comprises a coefficient rounding circuit that rounds each DCT coefficient of the transformed image data.

21. The method of claim 1, wherein creating an estimated quantization table from the received decompressed image comprises creating an estimated quantization table from the received decompressed image without having an original quantization table that was used to compress the received decompressed image.

22. The system of claim 11, wherein the quantization table estimator creates an estimated quantization table from the received decompressed image without having an original quantization table that was used to compress the received decompressed image.